B. TECH.
THIRD SEMESTER EXAMINATION, 2008-09
TCE-301, FLUID MECHANICS

Time: 3 Hrs.  
Maximum Marks: 100

Note: Attempt any Five questions. Assume suitable data wherever necessary.

1. Explain the following:
   (a) Compressibility and Elasticity of a fluid
   (b) Pascal's law & its proof
   (c) Difference between Laminar & Turbulent flow
   (d) Reynolds experiment

2. (a) A square disc of side 1m is immersed vertically in water so that an edge of the square makes an angle of 35° with the horizontal. If the highest corner is at the depth of 1.5m below the free surface, find the total pressure on the lamina and the depth of the centre of pressure.
   (b) List the different types of Differential Manometers. Describe two of them in details.

3. (a) Discuss Rayleigh Method of Dimensional Analysis with its required mathematical derivation.
   (b) Show by method of dimensional analysis that the resistance ‘R’ to the motion of a sphere of diameter ‘D’ moving with uniform velocity ‘V’ through a fluid having density ‘p’ and viscosity ‘μ’ may be expressed as:
   $$ R = (pD^3V) f(\mu / \rho VD) $$
   where ‘f(\mu / \rho VD)’ represents a function of (\mu / \rho VD).

4. (a) What is meant by one dimensional, two dimensional and three dimensional flows?
   (b) A stream function in a two dimensional flow is \( \Psi = 2xy \). Show that the flow is irrotational and determine the corresponding velocity potential \( \Phi \).

5. (a) What is water hammer? Obtain an expression for the rise in pressure in a thin elastic pipe of circular section in which the flow of water is stopped by sudden closer of valve.

[ Turn over ]
(b) A pipe 5 cm in diameter is 6 m long and the velocity of flow of water in the pipe is 2.4 m/sec. What loss of head and the corresponding horse power would be saved if the central 2 m length of pipe was replaced by 7.5 cm diameter pipe with sudden change of cross section? Consider ‘f’ = 0.04’ for the pipes of both diameters. \(10\)

6. (a) Derive Bernoulli’s equation from Euler’s equation of motion. \(8\)
   (b) Describe the application of Orifice Meter as method of measuring the discharge through pipes. \(12\)

7. (a) What do you understand by Notches? A rectangular weir 6 m long is divided into three bags by two vertical posts each 30 cm wide. Find the discharge when the head is 45 cm. \(8\)
   (b) Write short notes on Drag & Lift and use of Pitot Tube. \(12\)

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